QtCon BR

Qt For Robots: Interfaces, Sensores e Simuladores

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whoami?

Patrick Pereira / Electronic Eng.

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 https://patrickelectric.work

Work

Software Engineer

Software development for ROVs, sensors and user applications.

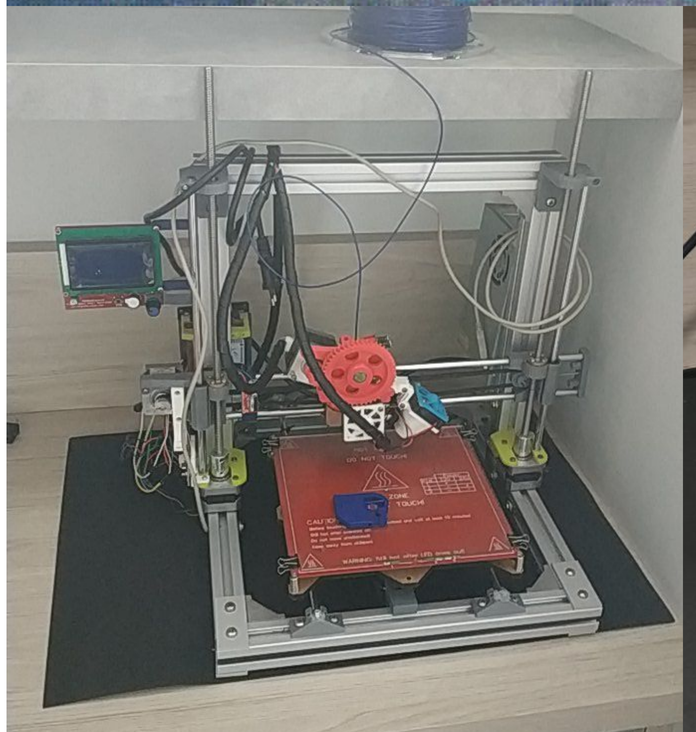
BlueRobotics

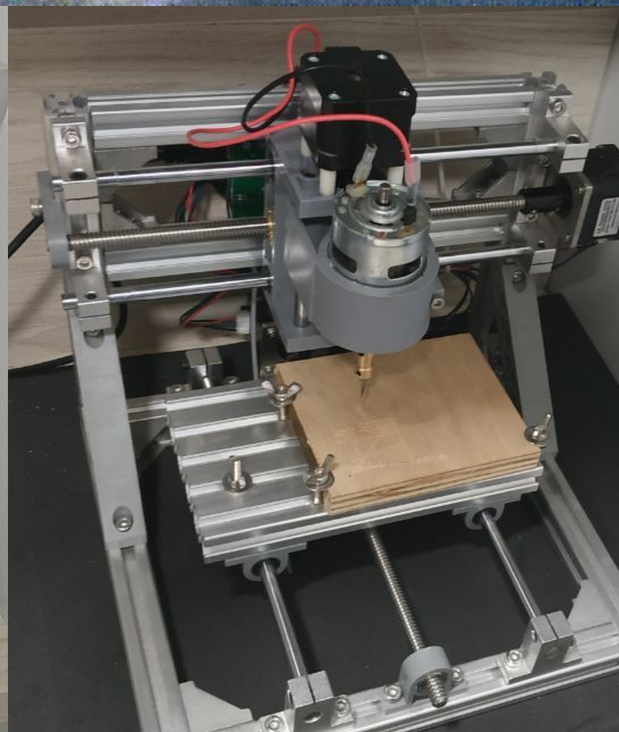
Hobby

Programmer

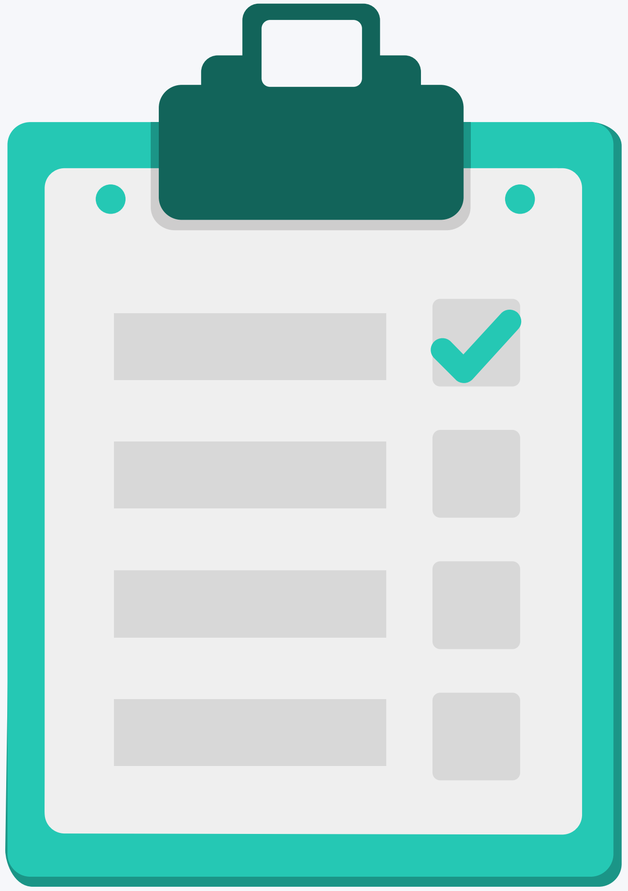
Contributions with AtCore, Atelier and random KDE projects.

atcore





Our Agenda



0. Introduction.
1. Data visualization.
2. Sensor integration.
3. Control.
4. 2D simulations.
5. 3D simulations.

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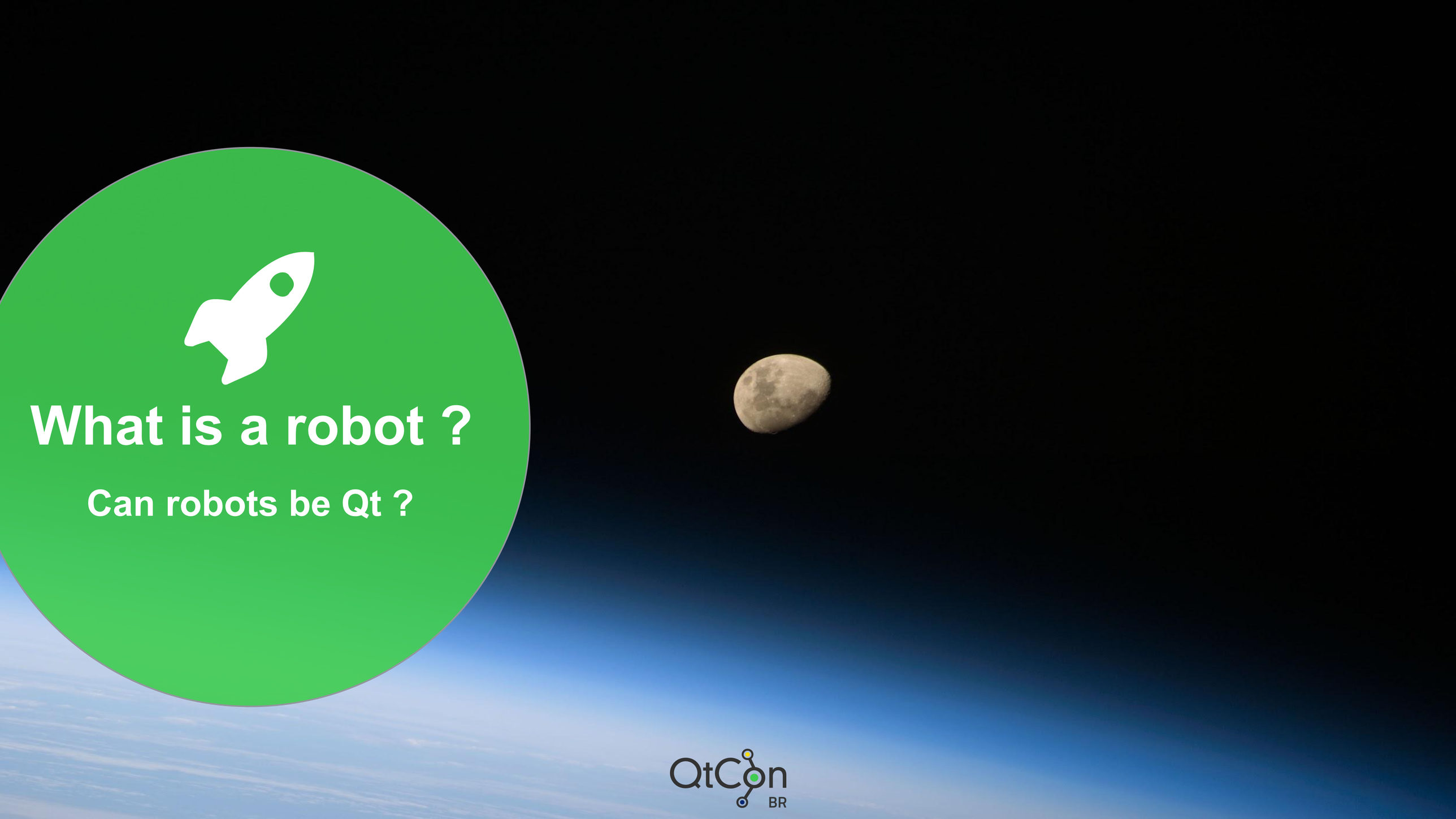

What is a robot ?

Can robots be Qt ?

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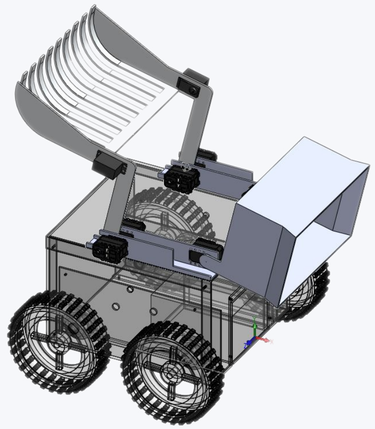
Examples

ROBOTA

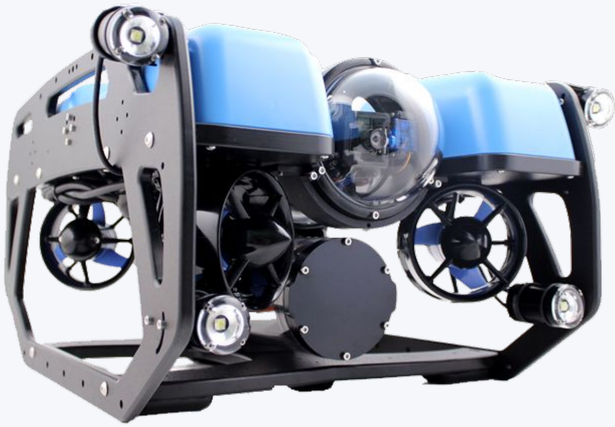


PROVANT
UFSC UFMG

HORUS
AERONAVES
DRONE MAPPING SOLUTIONS

Source: horusaeronaves.com

BlueRobotics



Source: bluerobotics.com

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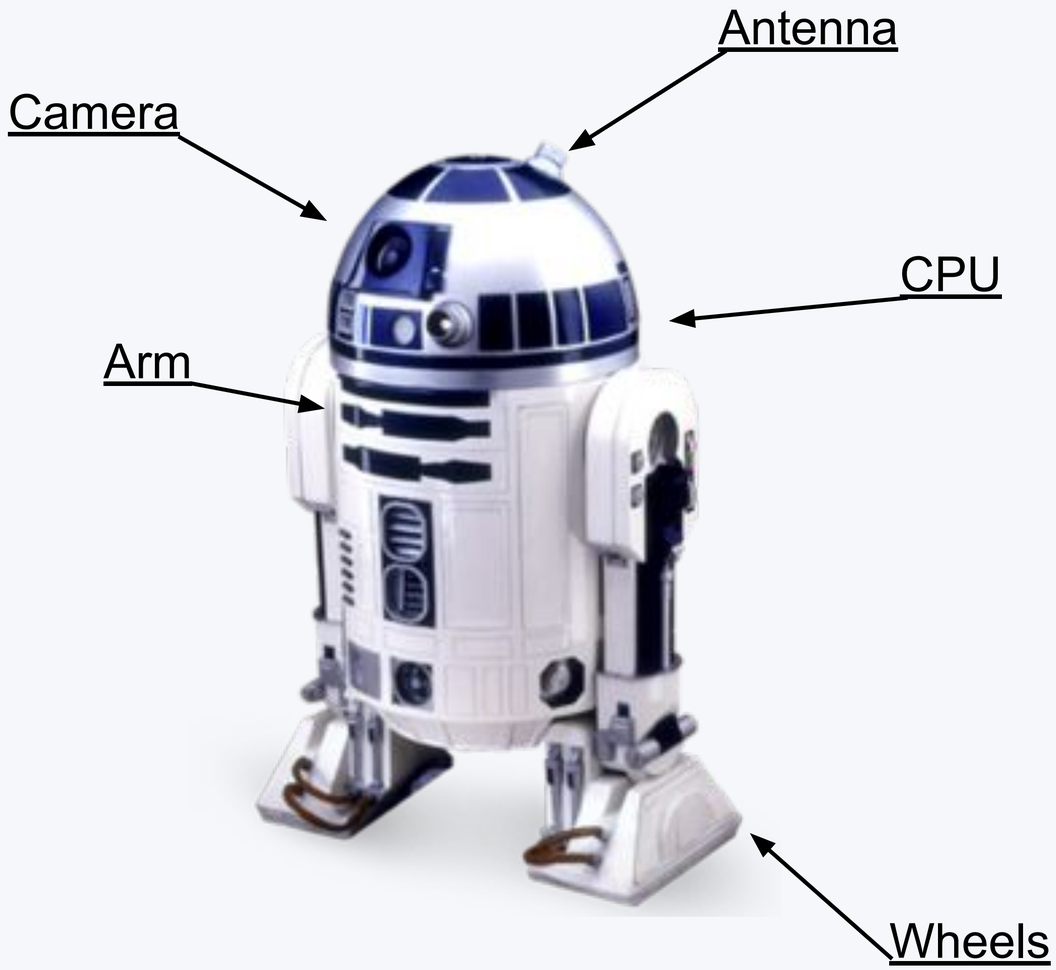
Show me what you got



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source: Wikipedia

Sensors

USB

I2C

SPI

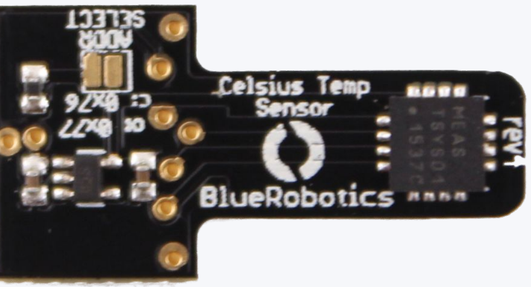
UDP

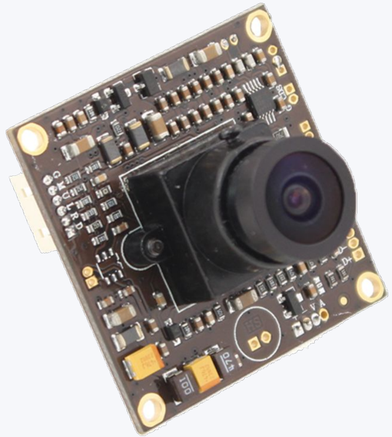
RS485

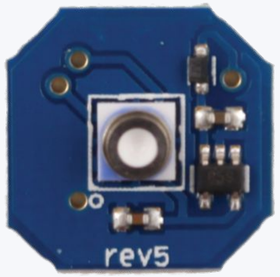
Serial

CAN

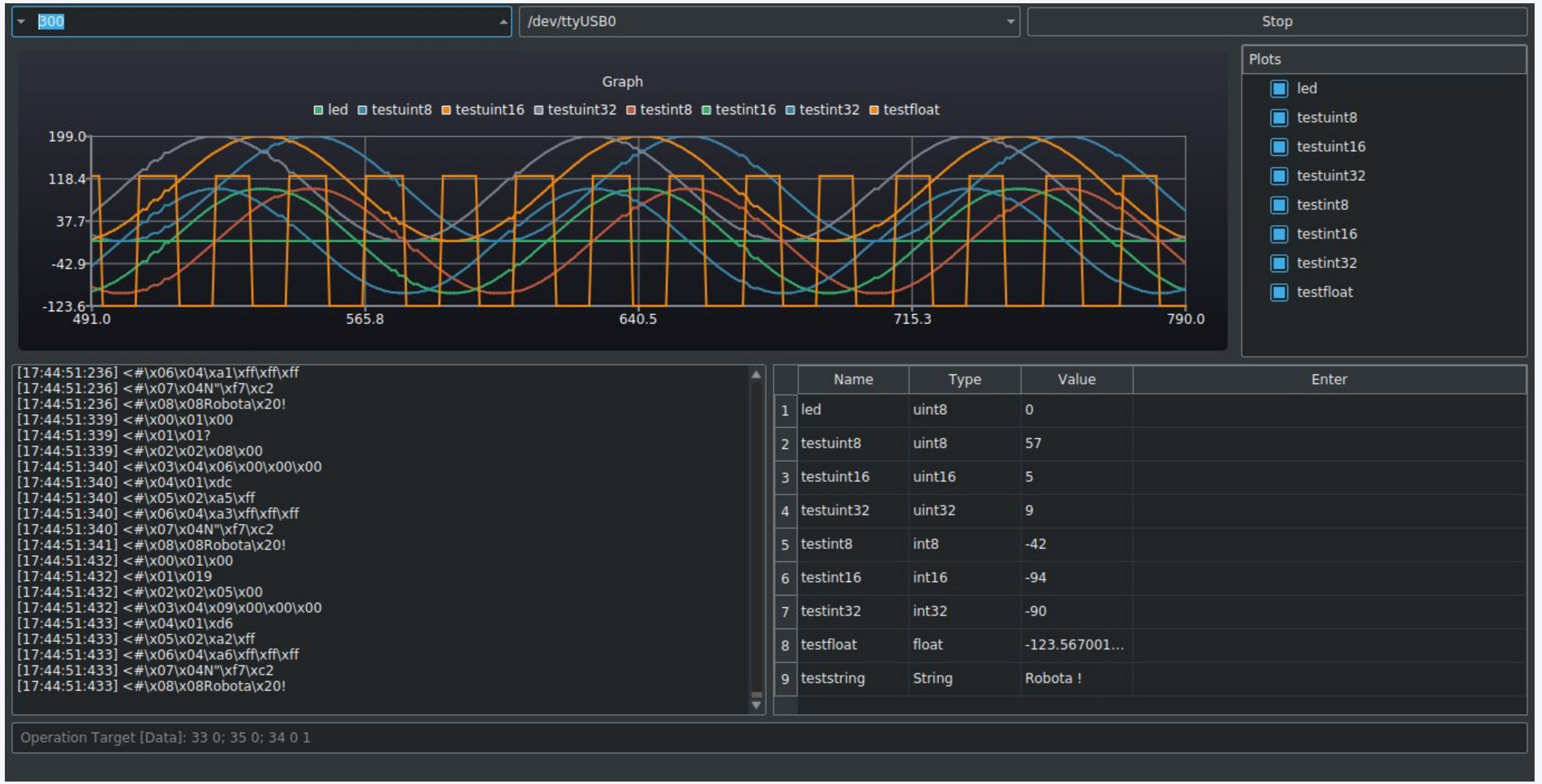
TCP







Exposer-GUI



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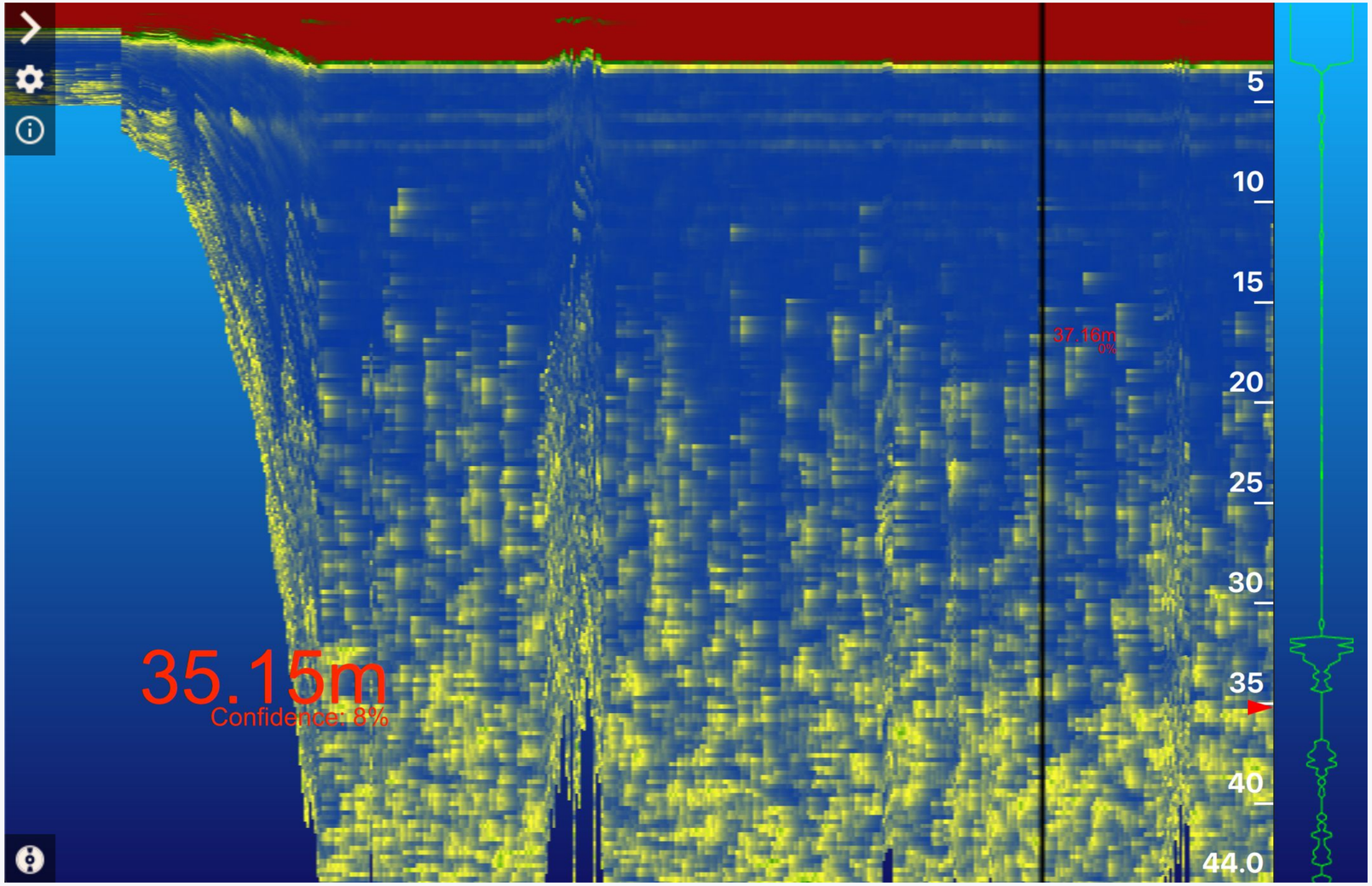
PingViewer [Demo]



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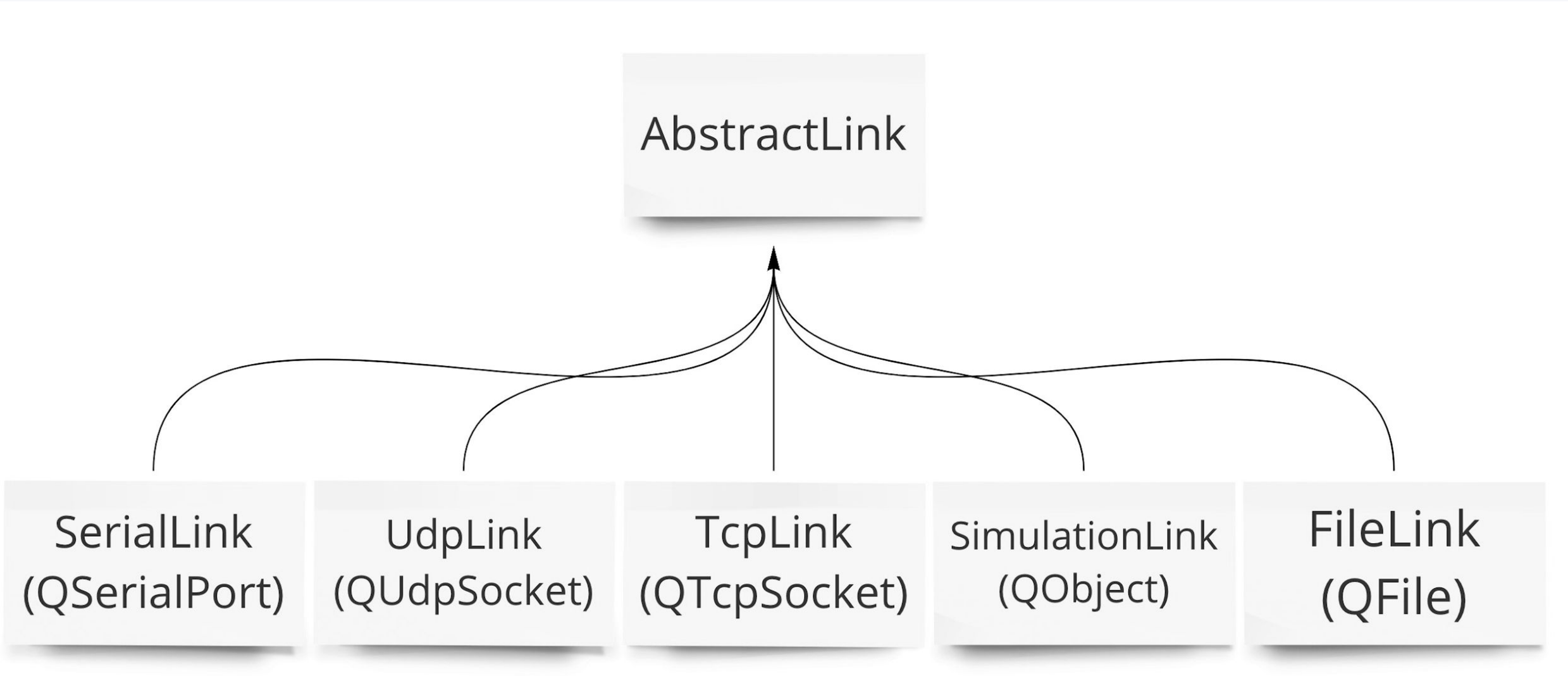
AbstractLink



AbstractLink

```
1.  //link.cpp
2.  Link::Link(LinkType linkType, QString name, QObject* parent)
3.      : QObject(parent)
4.      , _abstractLink(nullptr)
5.  {
6.      switch(linkType) {
7.      case LinkType::File :
8.          _abstractLink = new FileLink();
9.          break;
10.     case LinkType::Serial :
11.         _abstractLink = new SerialLink();
12.         break;
13.     case LinkType::Udp :
14.         _abstractLink = new UDPLink();
15.         break;
16.     case LinkType::PingSimulation :
17.         _abstractLink = new PingSimulationLink();
18.         break;
19.     default :
20.         qCCritical(PING_PROTOCOL_LINK) << "Link not available!";
21.         return;
22.     }
23. ...
```

```
1.  //sensor.cpp
2.  ...
3.  QSharedPointer<Link> _link;
4.  …
5.  AbstractLink* link() { return _link.data() ? _link->self() : nullptr; };
6.  Q_PROPERTY(AbstractLink* link READ link NOTIFY linkUpdate)
7.  …
8.  if(!link()->isOpen())
9.  …
10. if(!link()->isWritable())
11. …
12. if(link()->type() == LinkType::File)
13. …
14. connect(link(), &AbstractLink::newData, _parser, &Parser::parseBuffer);
15. …
16. SerialLink* serialLink = dynamic_cast<SerialLink*>(link());
17. ...
```

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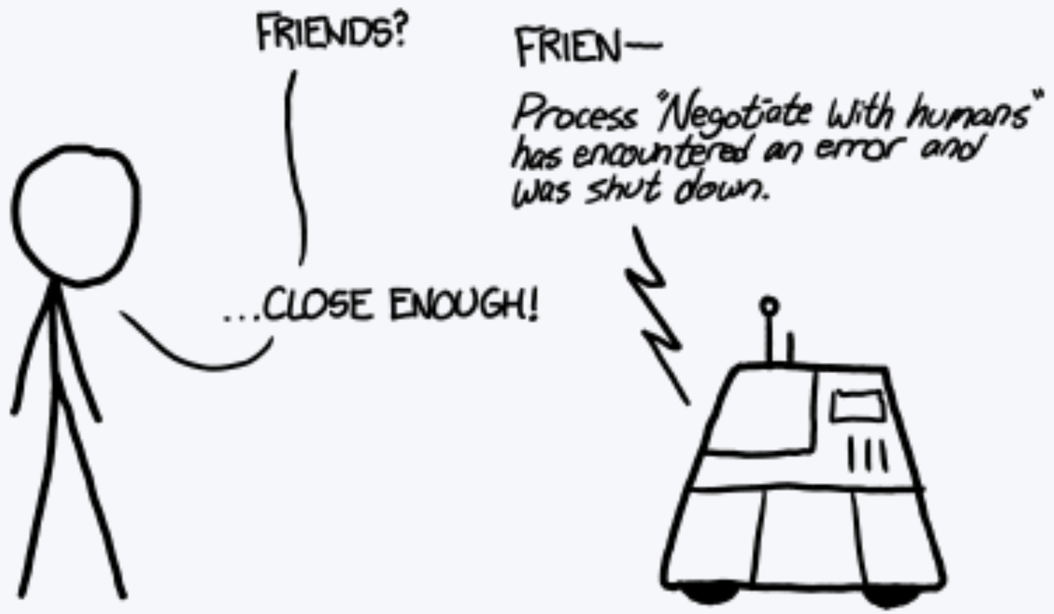
Control



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source: XKCD

Planes, Rovers, Boats and Submarines

The most advanced, full-featured and reliable open source autopilot software available. It is the only autopilot software capable of controlling any vehicle system imaginable, from conventional airplanes, multirotors, and helicopters, to boats and even submarines.

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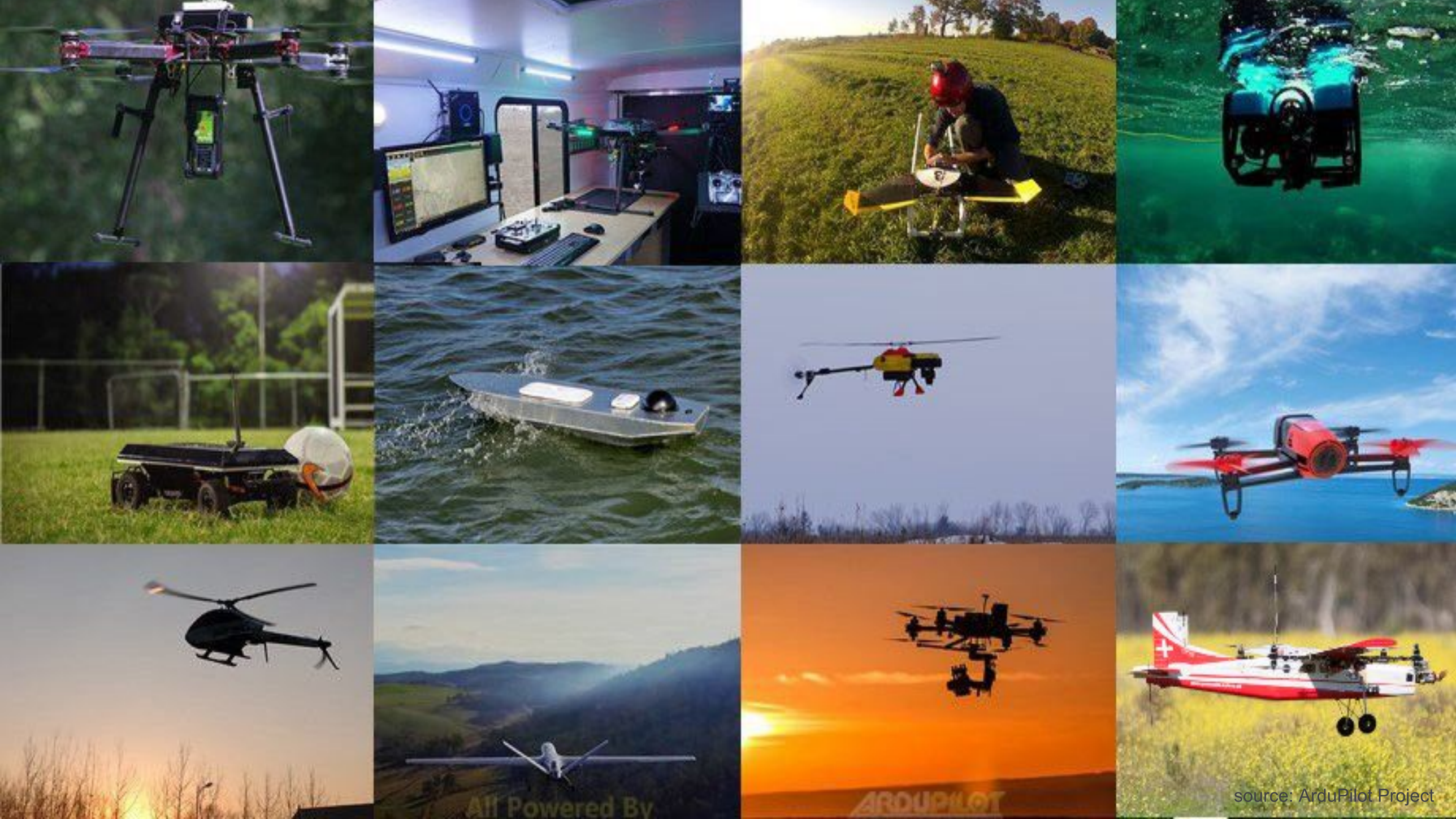
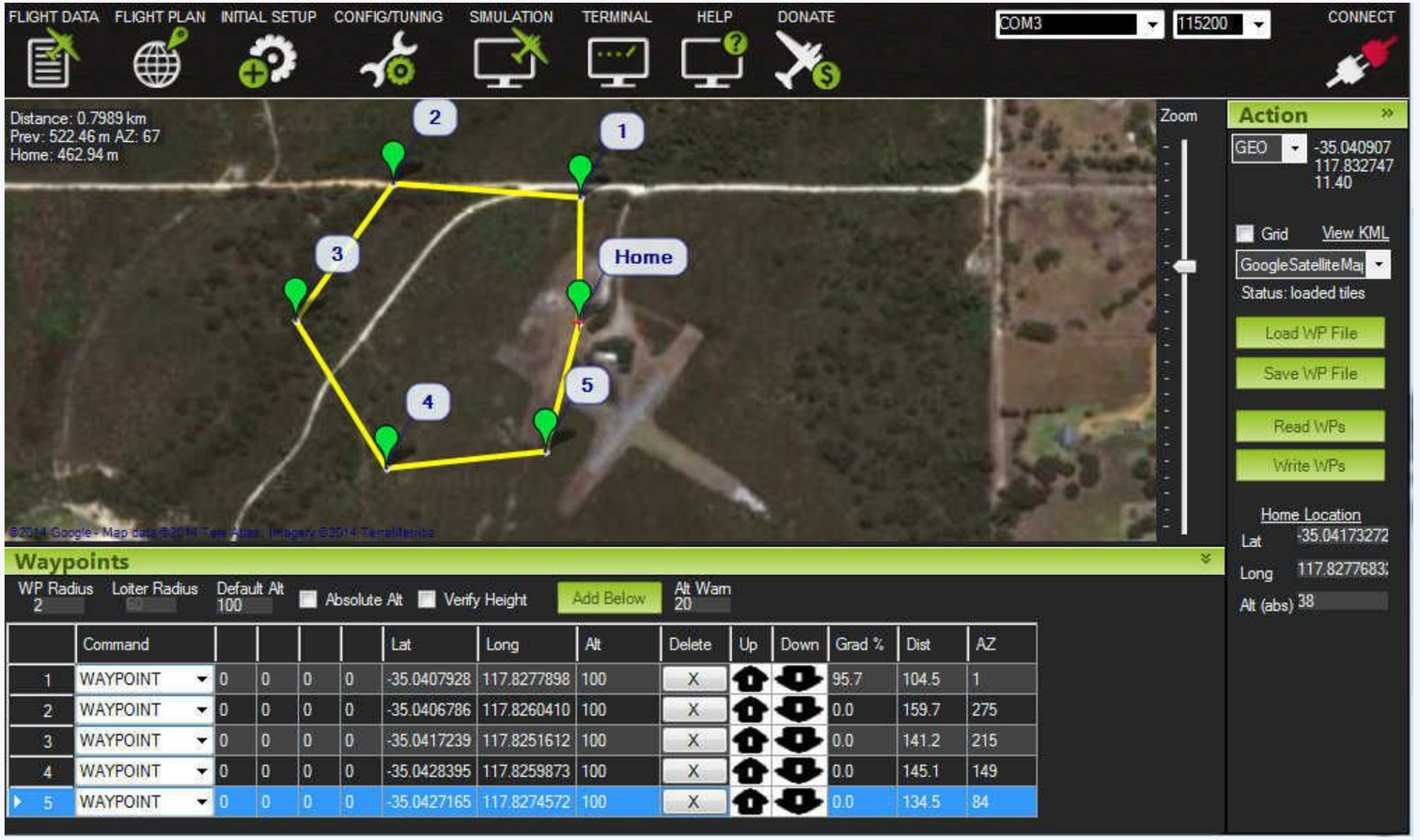

source: ArduPilot Project

Mission Planner

- Windows only
- C#
- Slow user input
- Older UI



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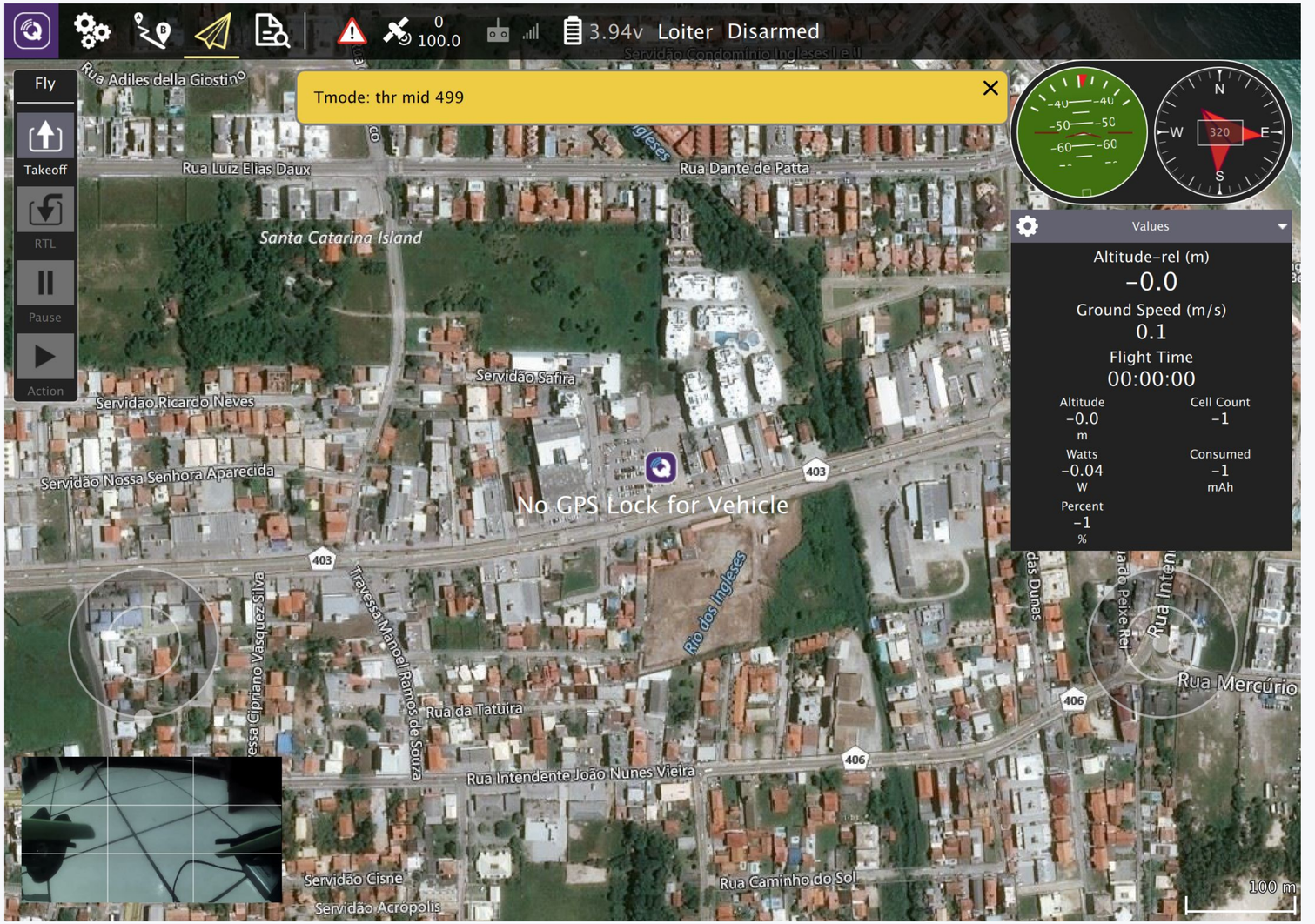
source: ardupilot.org

QGroundcontrol [Demo]

- Windows, Linux, Mac, Android and iOS
- C++
- Faster user input
- Modernish UI



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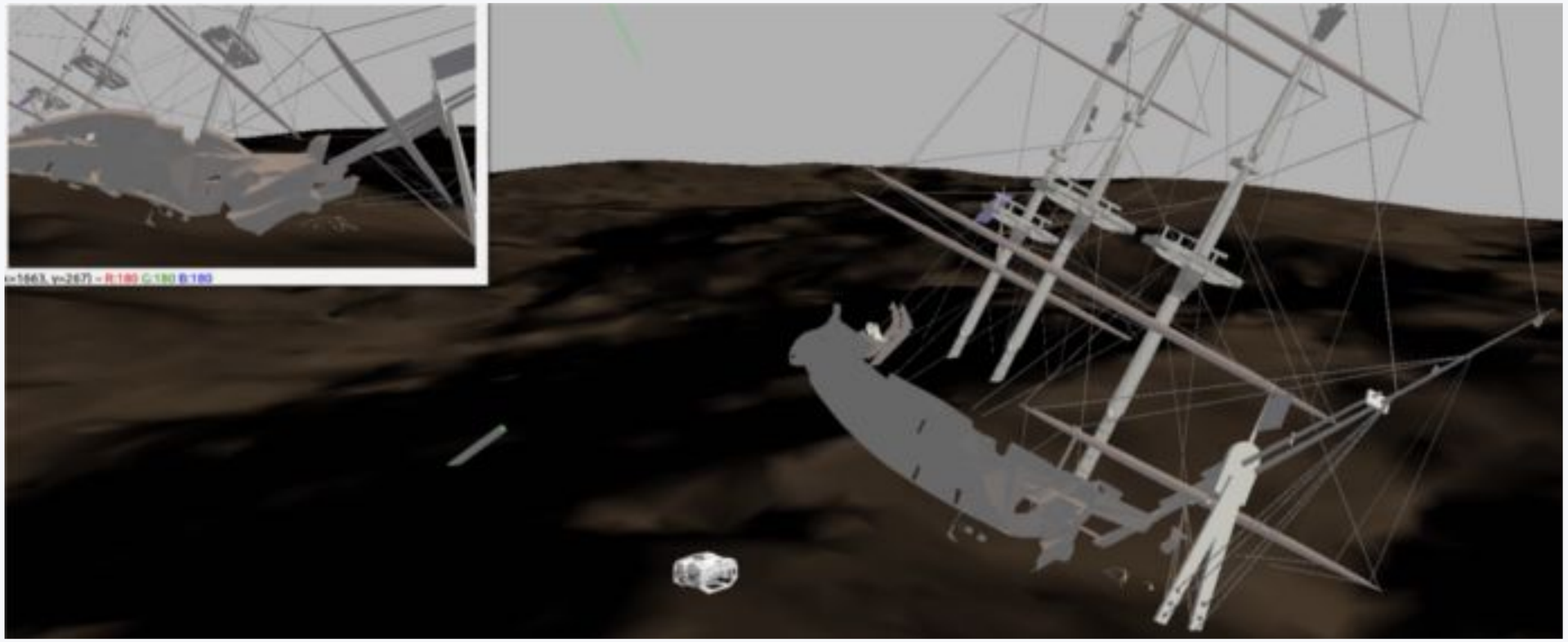
Simulation

- Gazebo
- V-REP
- ARGoS
- Microsoft Robotics
- ...

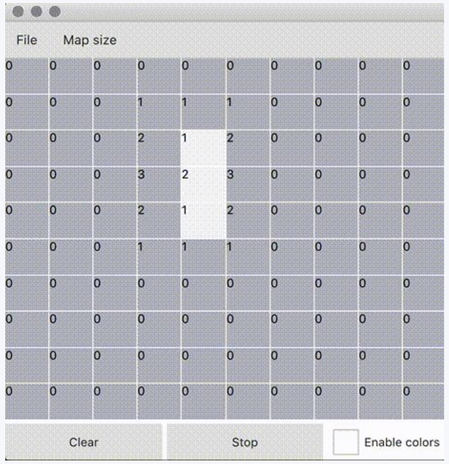


Gazebo with BlueROV simulation

Simulation

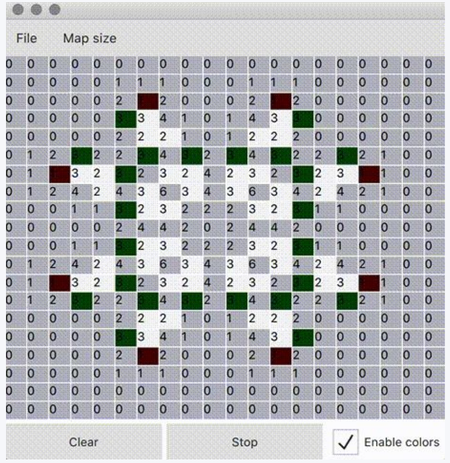
Behavior

- ✓ Development
- ✓ Debug
- ✓ Validation



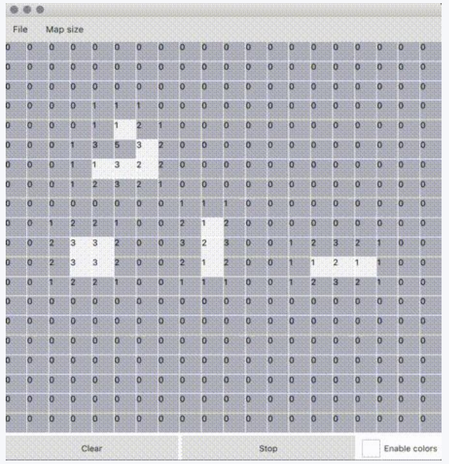
Desires

- ✓ Changes based on last state.



Interactions

- ✓ Interaction between models
- ✓ Interaction of model with ambient
- ✓ Simulation result and consequences



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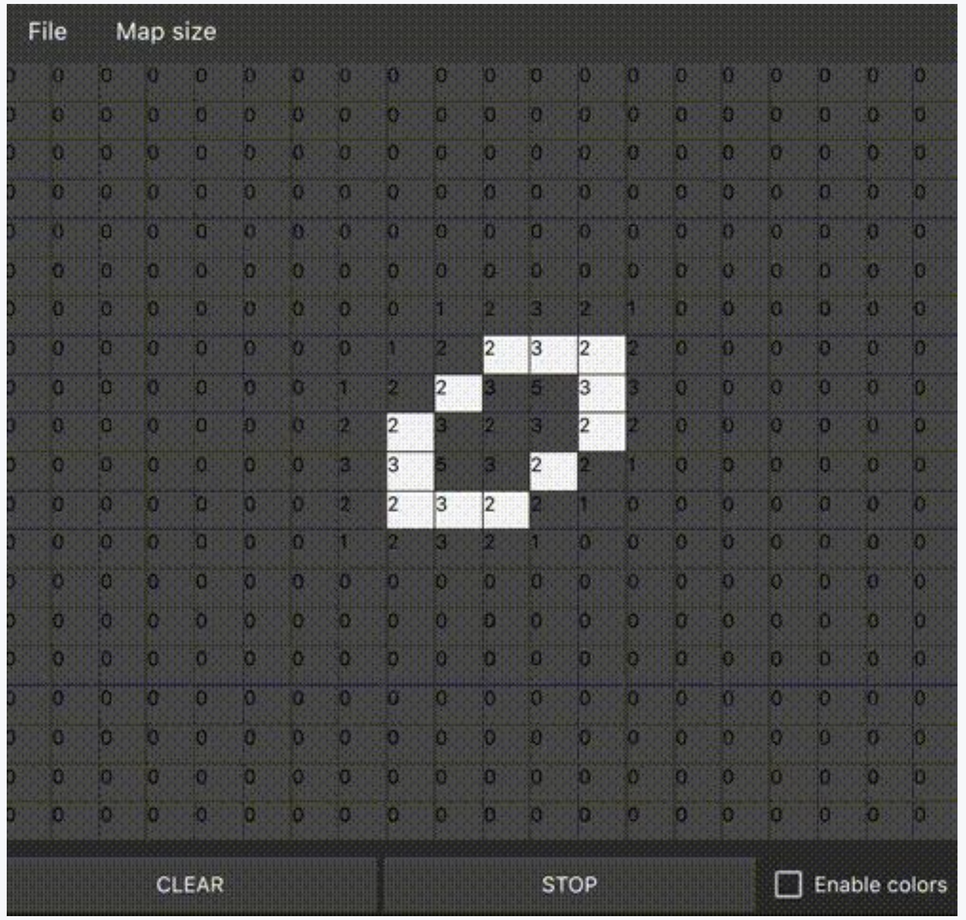
2D Simulation

SLAM



Conway's GoL

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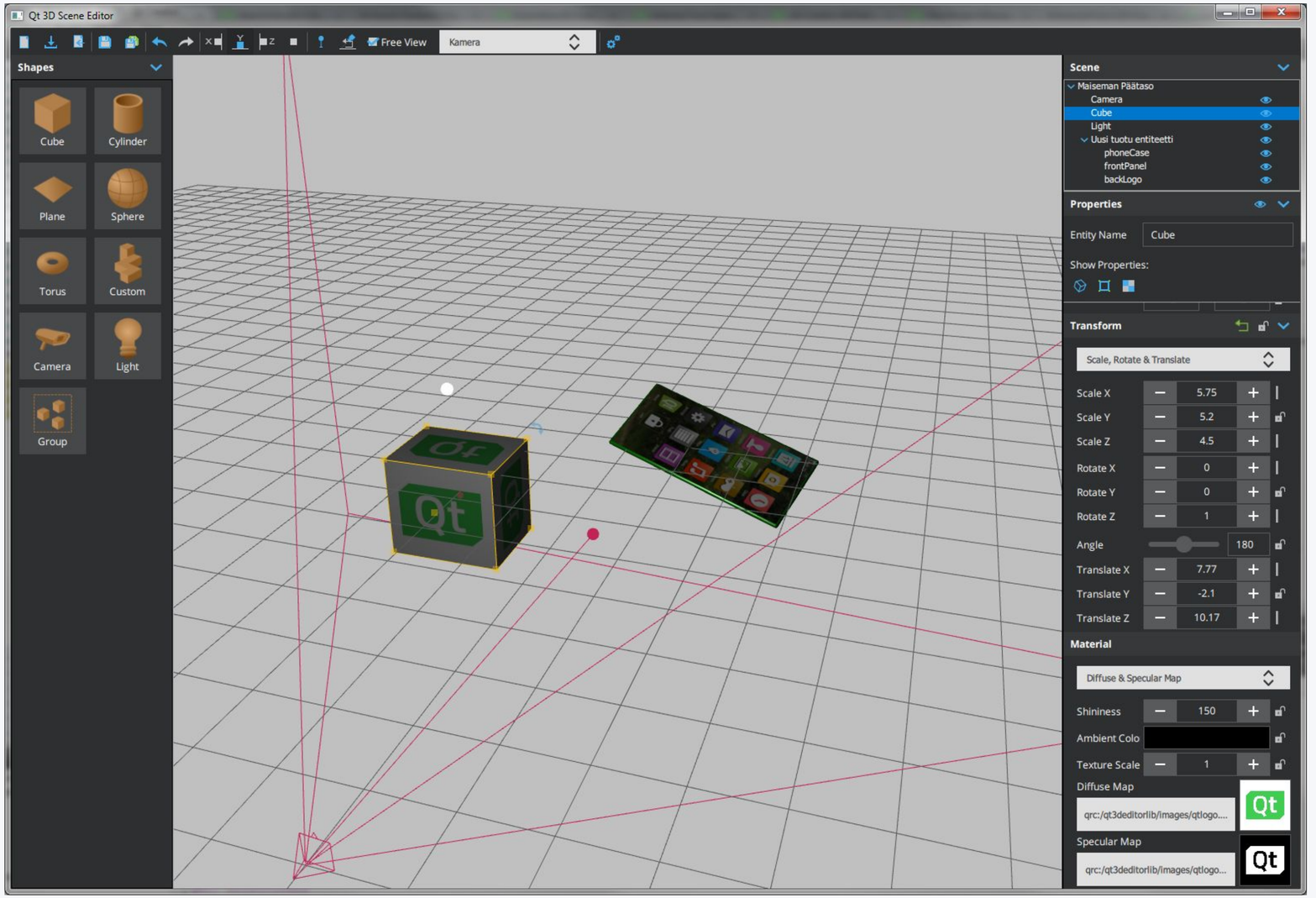
Qt 3D



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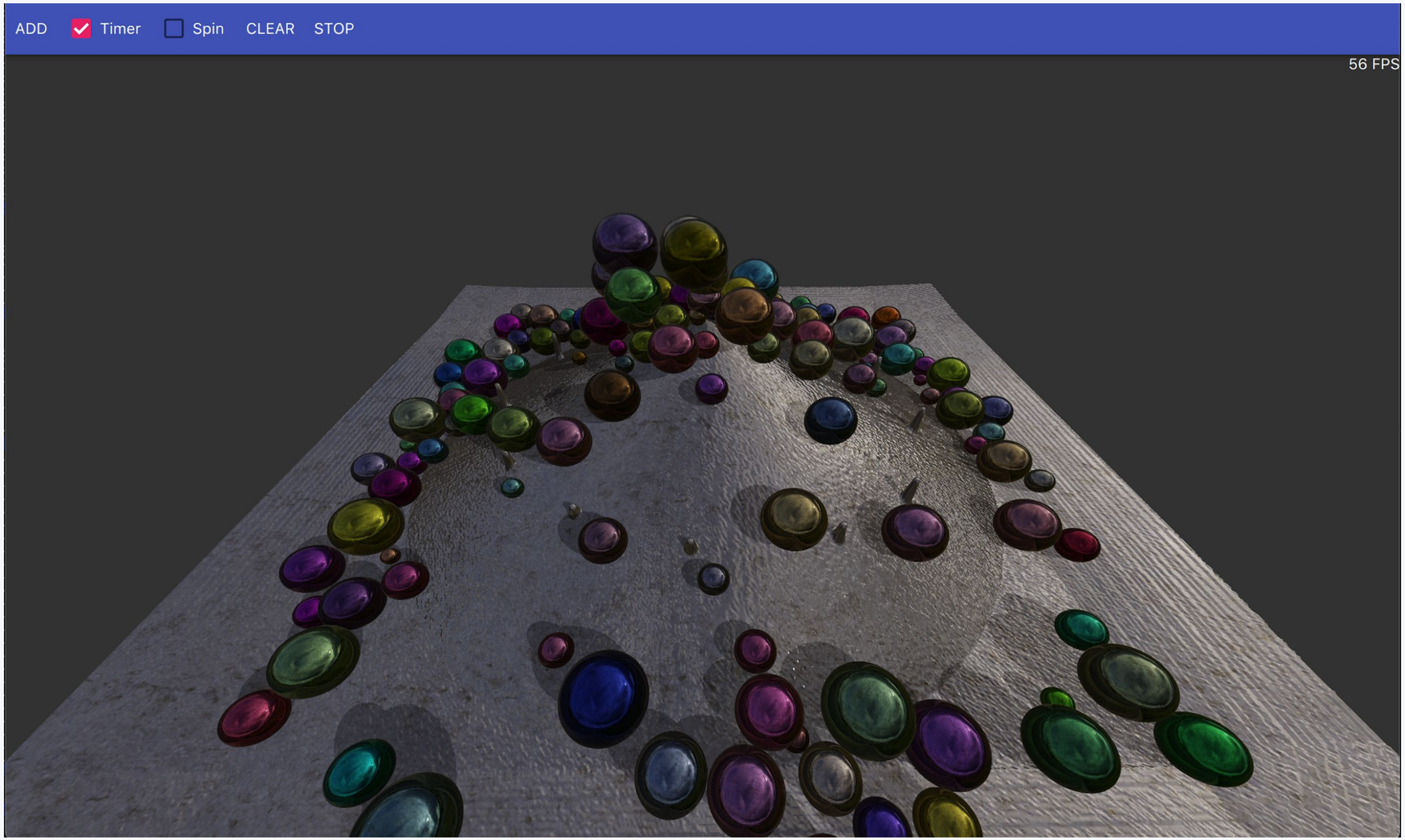
Source: blog.qt.io

Simple [Demo]



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Simple [Demo]

```
import QBullet 1.0 as Bullet
...
Bullet.DiscreteDynamicsWorld {
    ...
    gravity: Qt.vector3d(0, -9.8, 0)
}
```

```
...
BulletTools.Sandbox {
    heightmap: "qrc:/resources/heightmap.png"
    width: 250
    wallHeight: 50
    friction: 0.9
    restitution: 0.5
    ...
}
```

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Simple [Demo]

```
import QBullet 1.0 as Bullet
...
Bullet.SphereShape {
    id: sphereShape
    ...
}

Bullet.RigidBody {
    id: ballBody
    collisionShape: sphereShape
    ...
}

Ball {
    matrix: ballBody.matrix
    ...
}
...
```

```
// Ball
…
Entity {
    property alias matrix: transform.matrix

    Material { id: material }
    SphereMesh { id: mesh }
    Transform { id: transform }

    components: [ material, mesh, transform ]
}

```

Complex [Demo]

Obrigado!

perguntas?

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@patrickelectric

ArduPilot/ardupilot

bluerobotics/ping-viewer

bluerobotics/ping-protocol

mavlink/qgroundcontrol

patrickelectric/Conway-game-of-life-in-pyside2

patrickelectric/Qt3D-Konqi-Simulator

patrickelectric/SLAM_Qt

robotadasufsc/Exposer

robotadasufsc/Exposer-Gui

Williangalvani/provant-groundstation

csaga77/bullet-physics-qml-plugin

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